

What is claimed is:

- Sub 1731
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- 1 1. A substrate for an area array package,  
2 said substrate having a plurality of signal wirings, each having a first contact  
3 adapted to be connected to a respective terminal of an integrated circuit, and a second  
4 contact on a periphery of the substrate,  
5 said substrate having a ground structure including, for each signal wiring, a pair  
6 of rectangular ground plane portions located on opposite sides of the second contact of  
7 that signal wiring, and  
8 said substrate having a plurality of ground via holes through the substrate,  
9 including at least one respective ground via hole through each rectangular ground plane  
10 portion.
  - 1 2. The substrate according to claim 1, wherein each ground plane portion has a  
2 plurality of ground via holes therethrough.
  - 1 3. The substrate according to claim 1, wherein for each second contact, the  
2 respective ground plane portions are connected by a third ground plane portion on a third  
3 side of the second contact.
  - 1 4. The substrate according to claim 3, wherein the third ground plane portion has a  
2 plurality of ground via holes therethrough.
  - 1 5. The substrate according to claim 3, wherein the third ground plane portions of  
2 each second contact on at least a side of the substrate are continuously connected.
  - 1 6. The substrate according to claim 1, wherein each pair of adjacent ones of the  
2 second contacts have a single rectangular ground plane portion therebetween.
  - 1 7. The substrate according to claim 1, wherein the substrate has an opening  
2 therethrough sized and shaped to receive the integrated circuit.

1 8. An area array package comprising:

2 a substrate having:

3 a plurality of signal wirings, each having a first contact adapted to  
4 be connected to a respective terminal of an integrated circuit, and a second  
5 contact on a periphery of the substrate,

6 a ground structure including, for each signal wiring, a pair of  
7 rectangular ground plane portions located on opposite sides of the second  
8 contact of that signal wiring, and

9 a plurality of ground vias through the substrate, including at least  
10 one respective ground via hole through each rectangular ground plane  
11 portion;

12 a cover above the substrate, and

13 a bottom layer of the package formed of a dielectric material.

1 9. The package of claim 8, further comprising an intermediate dielectric layer

2 between the bottom layer and the substrate, the intermediate dielectric layer having an  
3 additional ground structure thereon.

1 10. The package of claim 9, further comprising a third ground structure between the  
2 bottom layer and the intermediate layer.

1 11. The package of claim 9, wherein the additional ground structure has a ground  
2 opening around a signal via that is coupled to the second contact, the ground opening  
3 being generally shaped like a rectangle with two mitered corners.

1 12. The package of claim 8, wherein the package has a signal via beneath each second  
2 contact, and a ground via beneath each ground via hole, each of the signal vias and  
3 ground vias being electrically connected to a respective solder attach pad on the bottom  
4 layer.

1 13. The package of claim 12, wherein each signal via is surrounded on three sides.

1 14. The package of claim 13, wherein each signal via is surrounded by at least seven  
2 ground vias.

1 15. The package of claim 8, further comprising a superstrate above the substrate, the  
2 superstrate generally being formed of the same material as the substrate.

1 16. The package of claim 15, wherein the superstrate has an opening therethrough  
2 above each second contact.

1 17. The package of claim 16, wherein the opening above each second contact is  
2 cylindrical and is greater in diameter than the ground vias.

1 18. The package of claim 16, wherein the opening above each second contact is filled  
2 with a material having a sufficiently low dielectric constant to reduce the radiation from a  
3 region of the second contact significantly.

1 19. The package of claim 8, wherein the package includes a plurality of pockets, each  
2 pocket shaped and sized to accommodate an integrated circuit.

1 20. A printed circuit board assembly, comprising:

2 a printed circuit board having a circuit board substrate with circuit traces and a  
3 plurality of devices thereon, said plurality of devices including at least one integrated  
4 circuit package assembly that includes:

5 a package substrate having:

6 a plurality of signal wirings, each having a first contact adapted to  
7 be connected to a respective terminal of an integrated circuit, and a second  
8 contact on a periphery of the package substrate,

9 a ground structure including, for each signal wiring, a pair of  
10 rectangular ground plane portions located on opposite sides of the second  
11 contact of that signal wiring, and

12 a plurality of ground vias through the package substrate, including  
13 at least one respective ground via hole through each rectangular ground  
14 plane portion;  
15 a lid above the package substrate, and  
16 a bottom layer of the package formed of a dielectric material, the bottom layer  
17 having a plurality of solder attach pads, electrically connected to contacts of the circuit  
18 board substrate.

1 21. An area array package comprising:  
2 a substrate having a plurality of signal wirings, each having a first contact adapted  
3 to be connected to a respective terminal of an integrated circuit, and a second contact on a  
4 periphery of the substrate, the substrate having a signal via penetrating each second  
5 contact;  
6 a superstrate formed of a dielectric material above the substrate, the superstrate  
7 having a respective opening therethrough above each second contact;  
8 a lid above the superstrate; and  
9 a bottom layer of the package formed of a dielectric material.

1 22. The package of claim 21, wherein the opening above each second contact is  
2 cylindrical and is greater in diameter than the ground vias.

1 23. The package of claim 21, wherein the superstrate is formed of the same material  
2 as the substrate.

1 24. The package of claim 21, wherein the substrate has a plurality of ground vias  
2 therethrough, at least partially surrounding each of the signal vias.

1 25. The package of claim 24, wherein the substrate has a plurality of rectangular  
2 ground plane portions surrounding each of the signal vias on three sides, the ground vias  
3 penetrating the ground plane portions.

1 26. A method for forming an area array package comprising the steps of:

forming a plurality of signal wirings on a substrate, each signal wiring having a first contact adapted to be connected to a respective terminal of an integrated circuit, and a second contact on a periphery of the substrate, the substrate being formed of a type of material suitable for use in a printed circuit board;

forming on a bottom layer of the area array package a plurality of solder attach pads aligned with the plurality of second contacts;

forming a plurality of signal via holes penetrating the second contacts and solder attach pads and penetrating through the substrate and the bottom layer;

filling the signal via holes with a conductive liquid capable of solidifying ; and solidifying the conductive liquid to form conductive signal vias.

27. The method of claim 26, further comprising plating the conductive vias.

28. The method of claim 26, further comprising

forming ground regions on the substrate;

forming on the bottom layer a plurality of ground solder attach pads aligned with the plurality of ground regions;

forming a plurality of ground via holes penetrating the ground regions and ground solder attach pads and penetrating through the substrate and the bottom layer;

filling the ground via holes with additional conductive liquid capable of solidifying ; and

solidifying the additional conductive liquid to form conductive ground vias.

29. The method of claim 26, wherein:

the substrate is formed of a material comprising PTFE with a ceramic filler, and the bottom layer is formed of a glass reinforced hydrocarbon/ceramic laminate.

30. The method of claim 29, further comprising attaching a superstrate above the substrate, the superstrate generally being formed of the same material as the substrate.

31. The method of claim 29, further comprising attaching a lid above the substrate, the lid being formed of FR4 or similar epoxy glass laminate.